

REMARKS / DISCUSSION OF ISSUES

In response to the final Office action¹ mailed on 5 August 2009 ("Office action"), the applicants respectfully request reconsideration in light of the amended claims. All of the issues raised in the Office action have been carefully considered and are addressed herein.

Claims 1-4, 8, 10, and 12-32 are pending in the application. Claims 5 and 7 are canceled herein, and claims 21-32 are newly added.

I. Rejection of claim 20 under 35 U.S.C. 112, second paragraph

The Examiner rejects claim 20 under 35 U.S.C. 112, second paragraph. Claim 20 is correspondingly amended herein to include a definition of an extended LED. Reconsideration of this rejection is respectfully requested.

II. Rejection of claims 1, 2, 8, 14, 18, and 20 under 35 U.S.C. 102(a)

The Examiner rejects claims 1, 2, 8, 14, 18, and 20 under 35 U.S.C. 102(a)² over Schevarado (EP 1,496,380). The applicants respectfully traverse this rejection.

Schevarado fails to teach an illumination device that includes a light extraction device adapted to extract the light from the solid light guide and output the light from the incoherent solid state light source in a direction that is substantially perpendicular to a light emission surface area S_0 , and includes a first surface area S_1 that is in optical contact with the solid light guide and a second surface area S_2 that outputs the light; wherein the first surface area S_1 is substantially smaller than the surface areas S_0 and S_2 , as claimed in claim 1, upon which claims 2-4 and 21-25 depend. Claim 8, upon which claims 10 and 12-20 depend, includes similar features.

¹ The Office action contains statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant(s) decline to automatically subscribe to any statement or characterization in the Office action.

² The Office action cites 35 U.S.C. 102(a), then references 35 U.S.C. 103(a) in the particular rejection. The applicants assume that these claims are rejected under 36 U.S.C. 102(a).

Schevarido teaches an integral light guide, and does not teach a light extraction device, per se. As detailed further below, the use of a discrete light extraction device provides advantages that are not realizable using conventional integral light guides.

Further, even assuming in argument that the portion of Schevarido's integral light guide identified by the Examiner corresponds to a light extraction device, Schevarido does not teach that this portion includes a first surface area for extracting the light that is smaller than a second surface area that is outputting the light, as claimed.

Because Schevarido fails to teach the elements of claims 1 and 8, the applicants respectfully maintain that claims 1, 2, 8, 14, and 18 are patentably distinct from Schevarido, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

Claims 2 and 20

Schevarido fails to teach that the light source includes a single extended LED having a length that is substantially larger than its width, as claimed in claims 2 and 20. Contrarily, Schevarido teaches an LED having a symmetric hemispherical shape. Accordingly, the applicants respectfully maintain that claim 2 is patentably distinct from Schevarido, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

Claim 14

Schevarido fails to teach that the light extraction means includes a prismatic optical component, as claimed in claim 14.

The Examiner asserts that the portion of Schevardo's light guide that the Examiner identifies as a light extraction device includes a prismatic optical component, but provides no basis for this assertion. Contrary to the Examiner's assertion, Schevardo illustrates the portion of the light guide asserted to be the light extraction device as a cylinder. Accordingly, the applicants respectfully maintain that claim 14 is patentably distinct from Schevardo, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

Claim 18

Schevardo fails to teach that the light circulation device has a cross-section thickness perpendicular to the light extraction area that is less near the light extraction area than at the light receiving surface, as claimed in claim 18.

The Office action asserts that Schevardo's light circulation device has a cross-section area near the portion asserted to be the light extraction device that is less than the cross-section area at the light receiving surface, but provides no basis for this assertion. Contrary to the Examiner's assertion, Schevardo illustrates that the cross section area is thickest at the asserted light extraction portion. Accordingly, the applicants respectfully maintain that claim 18 is patentably distinct from Schevardo, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

III. Rejection of claims 1-4, 8, 10, 13-17, and 19-20 under 35 U.S.C. 103(a)

The Examiner rejects claims 1-4, 8, 10, 13-17, and 19-20 under 35 U.S.C. 103(a) over Miyashita et al. (USP 6,011,602, hereinafter Miyashita) and Umemoto et al. (USP 6,690,625, hereinafter Umemoto). The applicants respectfully traverse this rejection.

The combination of Miyashita and Umemoto fails to teach or suggest a light extraction device that includes a first surface area S_1 that is in optical contact with the solid light guide and a second surface area S_2 that outputs the light, wherein the second surface area S_2 is substantially smaller than the surface area S_0 , such that an apparent brightness of the light output at the second surface area S_2 is substantially larger than an apparent brightness of the light source, as claimed in claim 1.

Independent claim 8 includes similar features.

The Examiner relies on Miyashita for teaching the claimed light extraction device. The applicants note, however, that Miyashita teaches an integral light guide and does not teach or suggest a light extraction device, per se.

Assuming in argument that the raised portion of Miyashita's light guide that is identified by the Examiner corresponds to a light extraction device, Miyashita does not teach or suggest that the apparent brightness of the light output from this portion is substantially greater than the light source, as claimed in each of claims 1 and 8. Contrarily, because the light from Miyashita's light guide is output from a plurality of raised portions, the apparent light output from each raised portion will be substantially less than the apparent light output of the light source. Equivalently stated, because Miyashita's total light output area is greater than the light input area, the apparent output brightness will be less than the apparent brightness of Miyashita's light source. The applicants also note that modifying Miyashita's design to provide only one raised portion would render Miyashita's device unsuitable for its intended function.

Because the combination of Miyashita and Umemoto fails to teach or suggest a light extraction device that includes a first surface area S_1 that is in optical contact with the solid light guide and a second surface area S_2 that outputs the light, wherein the second surface area S_2 is substantially smaller than the surface area S_0 , such that an apparent brightness of the light output at the second surface area S_2 is substantially larger than an apparent brightness of the light source, the applicants respectfully maintain that claims 1 and 8 are patentably distinct from the combination of Miyashita and Umemoto. Accordingly, the applicants respectfully request the Examiner's reconsideration and withdrawal of the rejection of claims 1-5, 7-8, 10, 13-17, and 19-20 under 35 U.S.C. 103(a) over Miyashita and Umemoto.

Claim 4

The Examiner asserts that it would be obvious to modify Miyashita to provide a light extraction area with a 16:9 aspect ratio. The applicants respectfully disagree with this assertion.

The shape of the applicants' light extraction area and/or light output area will determine the shape of the light output. The shape the light extraction or light output area of Miyashita's raised portion will not determine the shape of the light output. The shape of Miyashita's light output is determined by the arrangement of the array of raised areas. If one of skill in the art wanted a 16:9 aspect ratio using Miyashita's invention, there would be no motivation to modify the shape of Miyashita's light extraction area, as asserted by the Examiner. Accordingly, the applicants respectfully maintain that claim 4 is patentably distinct from the combination of Miyashita and Umemoto, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

Claim 13

The Examiner asserts that it would be obvious to modify Miyashita to provide a light extraction means that includes a compound parabolic collimator. The applicants respectfully disagree with this assertion.

The applicants' use of a compound parabolic collimator facilitates providing a collimated output having a particular projection shape. The use of a compound parabolic collimator in Miyashita raised portions would serve no obvious purpose in Miyashita, because, as noted above, the shape of Miyashita's light output is determined by the arrangement of the array of raised areas. If one of skill in the art wanted a collimated output using Miyashita's invention, there would be no motivation to include a compound parabolic collimator in the raised portions that are asserted to correspond to the claimed light extraction means, as asserted by the Examiner. Accordingly, the applicants respectfully maintain that claim 13 is patentably distinct from the combination of Miyashita and Umemoto, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

Claims 15 and 16

The Examiner asserts that Miyashita discloses a reflective polarizer disposed in an optical path between the light extraction area and the light extraction means. This assertion is incorrect.

As noted above, Miyashita teaches an integral light guide. The Examiner asserts that Miyashita's raised portion corresponds to the claimed light extraction means, and the base of these integral raised portions corresponds to the light extraction area. Assuming the Examiner's assertions in argument, the applicants note that there is no material situated between the asserted light extraction area and light extraction means, and specifically, there is no reflective polarizer disposed in an optical path between the asserted light extraction area and the light extraction means, as taught and claimed by the applicants. Accordingly, the applicants respectfully maintain that claims 15 and 16 are patentably distinct from the combination of Miyashita and Umemoto, and respectfully request the Examiner's reconsideration and withdrawal of this rejection.

IV. Comments regarding the new claims

The applicants' teaching of providing a light extraction device that is distinct from the light circulation device allows for various arrangements of ancillary optical components, and various light output features, that are not achievable using conventional integral light guides, as noted above. The arrangements of claims 15 and 16, for example, are unachievable using the conventional integral light guide taught Miyashita.

The applicants respectfully maintain that providing a discrete light extraction device is critical to providing this capability, as well as providing the potential for reduced production costs and design flexibility. In the particular case of using a compound parabolic collimator such as illustrated in the applicants' FIGs. 3 and 4, for example, the mold required to create an integral light guide and compound parabolic collimator would be quite complex because of the concave shapes at the contact area.

Newly added claims 26-32 specify a particular manufacturing method that is neither taught nor suggested by Schevardo and Miyashita. Conventional manufacturing techniques and economies would argue in favor of the integral designs of Schevardo and Miyashita, to avoid the extra processing steps of creating a discrete light extractor and then having to couple the two elements together. Given the teachings of an economical manufacturing process to produce the structures taught by Schevardo and Miyashita, one of ordinary skill in the art would not be motivated to create these structures using the applicants' claimed method, absent the applicants' teachings of the advantages that can be gained by this apparently less efficient process.

In view of the foregoing, the applicants respectfully request that the Examiner withdraw the objection(s) and/or rejection(s) of record, allow all the pending claims, and find the application to be in condition for allowance. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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